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Geoconservation for science and society – an agenda for the future

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ABSTRACT

The Earth's rich diversity of geological, geomorphological and soil features and processes are an integral part of the natural environment on which we all depend. The conservation and management of these features and processes is essential if we are to maintain the sites needed for research, education and training and the natural systems which provide us with 'ecosystem goods and services' such as water purification and erosion regulation. Geoconservation is now established in many parts of the World and has been part of statutory nature conservation in the UK for more than 60 years. With environmental, social, economic and political changes now affecting the whole of society, it is timely to explore how best to sustain and develop geoconservation in a rapidly changing World. Drawing on 15 papers exploring the future of geoconservation that originated from the 2011 Geologists' Association Conference, an overview of the current context for geoconservation is provided and some of the challenges faced, and opportunities to be taken, are captured and considered. A key message to emerge from the conference and papers is that the future of geoconservation should be built upon what has already been achieved, but with greater emphasis now being placed on communicating and engaging with decision makers and the wider public, using language and arguments that will convince them that geoconservation is relevant to their lives and to society as a whole, as well as to science. Priorities and activities to help move geoconservation forward are set out.

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1. Introduction

The papers that make up this Special Issue of the *Proceedings of the Geologists' Association* arose from, or were inspired by, the Geologists' Association Annual Conference, *Geoconservation for science and society: an agenda for the 21st Century*, held at the University of Worcester, England, on the 9th and 10th September 2011. The majority of the papers that follow were presented either verbally or as posters at the conference, others were inspired by discussion at the conference and were commissioned for this Special Issue.

The conference attracted over 100 delegates from a wide range of backgrounds and included professional and amateur geoscientists, geoconservation volunteers, the minerals extraction industry, land managers, archaeologists, government agencies and a government department. It sought to capture and build upon sixty-plus years of geoconservation progress and the substantial resource of legislation, policy, protected sites, expertise, literature, experience and active groups, associations and societies that now exists. It also provided an opportunity to move forward from previous meetings that have helped to shape geoconservation policy and practice in the UK and more widely. For example, international geoconservation conferences held in Digne (France) in 1991 (Martini and Pagès, 1994) and Malvern (England) in 1993 (O'Halloran et al., 1994), the *Earth heritage: World heritage* conference held in Wareham (England) in 2004, the Global Geoparks conference, held in Belfast (Northern Ireland) in September 2006, the fossil collecting focused conference, *A future for fossils*, held in Cardiff (Wales) in 1998 (Bassett et al., 2001), conferences organised by the geoconservation voluntary sector in the UK to address conservation on the ground (e.g. Oliver, 1998, 1999; Addison, 2000), the conference on geodiversity and climate change held in Chester, 2009 (Prosser et al., 2010), and, most recently, the conference *Engaging with geodiversity, why it matters*, held in Edinburgh (Scotland) in 2010 (Hansom, 2012).

Most importantly, at a time of environmental, social, economic and political change affecting the whole of society, and not least the way in which the natural environment is viewed and managed, the 2011 Geologists' Association conference provided a timely opportunity for those interested in the conservation, management

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and promotion of our geoheritage to come together to explore the challenges and the opportunities that currently exist and to consider and refresh the agenda for the future of geoconservation.

As with many disciplines, especially those involving science, legislation and policy, the subjects explored in this Special Issue have many terms associated with them and, inevitably, there are a number of different interpretations and uses of them. The terms '*geodiversity*', '*geoscience*' and '*geoconservation*' are used widely throughout this Special Issue and in general they are used as follows. '*Geodiversity*' is used to describe the geological, geomorphological and soil resource that exists, and was defined by Gray (2004) as "the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (land form, processes) and soil features, including their assemblages, relationships, properties, interpretations and systems". '*Geoscience*' is used to describe activities relating to the study and understanding of the Earth, especially with regard to its geology, geomorphology, soils and the processes associated with them. '*Geoconservation*' is a more concise way of referring to geological, geomorphological and soil conservation and relates to activities aimed at conserving geodiversity for future generations. It is defined by Prosser (2013) as 'action taken with the intent of conserving and enhancing geological, geomorphological and soil features, processes, sites and specimens, including associated promotional and awareness-raising activities, and the recording and rescue of data or specimens from features and sites threatened with loss or damage'.

2. The context for geoconservation

2.1. Geoconservation for science

Geoconservation, which provides a means of conserving and enhancing the most important geodiversity sites, areas and features (Prosser, 2013), has historically been focussed on the primary objective of conserving those sites required to support research, study and education. Although increasing emphasis is now being placed by many on geoconservation to support tourism and recreation (e.g. as with Global Geoparks), 'geoconservation for science' has undoubtedly been the predominant driving force for many geoconservationists. After all, conserving the sites that enable us to understand the history of the Earth, past environmental change, the evolution of life, the processes that shape our environment today and the nature and location of natural resources on which we depend, makes obvious sense to most geoscientists, and hopefully to the public at large. Furthermore, in addition to supporting geoscience, these sites also underpin wider scientific study into the nature and functioning of the natural environment (including biodiversity), environmental change and hazard management; matters that are essential to present and future wellbeing.

This 'geoconservation-for-science' led approach has been very successful over the last 60 years in establishing geoconservation as a recognised part of nature conservation with a well defined rationale and established principles and practice. It has generated a vast resource of protected sites, places and features (Wimbledon and Smith-Meyer, 2012; Prosser, 2013) and will continue to be a fundamental part of geoconservation into the future. It is, however, still a discipline in its infancy and there is still much to learn and debate. For example, the impacts of climate change on tried and tested methods of practicing geoconservation (Prosser et al., 2010; Brown et al., 2012), and ways of quantifying geodiversity and its loss (Ruban, 2010, 2011; Knight, 2011) are areas where further evidence, analysis and debate is required to develop new approaches to geoconservation and to refine those that exist.

More widely, there are also many new challenges to be faced, opportunities to be taken and a changing environmental, social and political context to be understood and adapted to (Henriques et al., 2011; Prosser et al., 2011; Gordon et al., 2012; Whiteley and Browne, 2013; Erikstad, 2013; Gray et al., 2013). In particular, there is a growing recognition that despite the undoubted importance of 'geoconservation-for-science', the wider political and public support required in order for geoconservation to thrive into the future, is unlikely to be established unless its appeal is broadened and it is seen to be delivering benefits for society more widely. The importance of scientists making an economic and societal impact with their research through 'knowledge exchange' with end users and beneficiaries of their science, is now widely recognised, for example through some current funding models for scientific research. This need for 'relevance' is even more important for geoconservation and it is timely for geoconservationists to consider the wider environmental, social and economic context in which we operate and to demonstrate how the conservation of the sites on which geoscience depends is also of relevance to society.

2.2. Geoconservation for society

Global pressures driven by population growth, economic 'boom and bust' and projected environmental change mean that society and the Earth's natural environment are subject to increasing stress. As a response to the challenges faced, a number of high level environmental and social agendas, policies and initiatives have been developed, many of which are based on the concept of sustainable development. By sustainable development we mean development that meets the needs of the present without compromising the ability of future generations to meet their needs (Brundtland, 1987). Geoscience and geoconservation can be applied to assist with these agendas, in particular with regard to understanding and managing environmental change (including climate change), managing ecosystem goods and services through taking an ecosystem approach (Gray et al., 2013) and improving the quality of life for local communities through enhancing their local environment. In reality, the geoscience and geoconservation communities are already starting to recognise and engage with these opportunities and challenges.

In terms of understanding sustainable development and managing environmental change, a number of initiatives already exist where it is possible to link environmental and social challenges with application of geoscience and the conservation of geodiversity. For example, the United Nations International Year of Planet Earth (IYPE): Earth Science for Society in 2008 (www.yearofplanetearth.org), highlighted the importance of the Earth's rich and diverse geo-environments and the value of geoscience in improving quality of life. It encourages increased levels of Earth science education to help society ensure the sustainable use of natural resources and to promote science as the basis for sustainable development (Woodfork and de Mulder, 2011).

Understanding environmental change requires an understanding of how natural systems operate and their capacity to adapt to future change. The International Council for Science's publication, *Earth System Science for Global Sustainability: the Grand Challenges* (ICSU, 2010) called for more integrated solutions to understanding Earth systems and the impact of human actions. The 'Grand Challenges' include 'forecasting' and 'observing' and recognise the need to incorporate palaeo-data to advance understanding. The cross-disciplinary approaches to understanding and managing the natural environment are further demonstrated by Anderson and Feree (2010), who show that in terms of climate change adaptation, 'protecting geophysical settings conserves the stage for current and future biodiversity'. The international PAGES (Past Global Changes) project, part of the International Geosphere-Biosphere Programme (IGBP), also makes the links between past, present and future environmental change through promoting and

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